MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

SRM Number: 3152a
MSDS Number: 3152a
SRM Name: Sodium Standard Solution

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Description: This Standard Reference Material (SRM) is intended for use as a primary calibration standard for the quantitative determination of sodium. Each unit consists of 50 mL of a single-element solution in a high-density polyethylene bottle sealed in an aluminized bag. The solution is prepared gravimetrically to contain a known mass fraction of sodium. The solution contains nitric acid at a volume fraction of approximately 1 %.

Material Name: Sodium Standard Solution

Other Designations:

Sodium: Na; elemental sodium; natrum.
Sodium Nitrate: Nitrate of soda; Chile saltpeter; nitric acid monosodium salt; cubic niter.
Nitric Acid: Aqua fortis; hydronitrate; azotic acid; engraver's acid.

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component	CAS Registry	EC Number (EINECS)	Concentration (%)
Nitric Acid	7697-37-2	231-714-2	10
Sodium Nitrate	7631-99-4	231-554-3	3.7
Sodium	7440-23-5	231-132-9	1

EC Classification, R/S Phrases: Refer to Section 15, Regulatory Information.

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0-4): Health = 4 Fire = 0 Reactivity = 1

Major Health Hazards: Nitric acid can cause severe or fatal burns if inhaled, swallowed, or absorbed through the skin. Sodium nitrate is an irritant by all three routes. Sodium may react with water to form corrosive NaOH.

Physical Hazards: Some mixtures are explosive (Section 10).

Potential Health Effects

Inhalation: Nitric acid can damage the mucous membranes and respiratory tract, causing spasm, inflammation of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Teeth may also be damaged. Inhalation of sodium nitrate may irritate the respiratory tract. Sodium may react with moisture in the lungs to form corrosive sodium hydroxide (NaOH), which can cause pain, coughing, shortness of breath, pulmonary edema (up to 72 hours after exposure), and collapse.

Skin Contact: Nitric acid can cause severe skin burns. Effects of acid burns may be delayed. Skin contact with sodium or sodium nitrate may cause irritation.

Eye Contact: Nitric acid can cause severe eye irritation, corneal burns, permanent eye damage, or blindness. Sodium nitrate may cause eye irritation with redness and pain. Sodium may react with moisture in the eye to form corrosive sodium hydroxide, which can damage the eye.

Ingestion: Nitric acid can cause severe burns and damage to the GI tract. Ingestion of sodium nitrate may damage the GI tract. Repeated or prolonged exposure to sodium (by ingestion or inhalation) may damage the GI tract and cause ulcers and inflammation in the mouth.

Medical Conditions Aggravated by Exposure: None documented for this mixture. Its components may aggravate disorders of the eyes, skin, respiratory tract, kidneys, nervous system, cardiovascular system, and/or blood.

Listed as a Carcinogen/ Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens		X
In the International Agency for Research on Cancer (IARC) Monographs		X
By the Occupational Safety and Health Administration (OSHA)		X

4. FIRST AID MEASURES

Inhalation: Move the person to fresh air immediately. If not breathing, qualified personnel may start CPR or give oxygen if necessary. Get medical aid at once, and bring the container or label.

Skin Contact: Remove contaminated clothing and shoes. Flush affected skin with water for at least 15 minutes, then wash thoroughly with soap and water. If burns are severe or if skin irritation persists, get medical aid and bring the container or label. Wash contaminated clothing before reusing.

Eye Contact: Remove contact lenses (if any). Do not allow victim to rub eyes or keep eyes closed. Flush eyes with large amounts of running water for at least 30 minutes, keeping eyelids open and raising lids to remove all chemical. Get medical aid at once, and bring the container or label.

Ingestion: Contact a poison control center immediately for instructions. Wash out mouth with water, but do not induce vomiting. Get medical aid at once, and bring the container or label.

Note to Physician (Nitric Acid): Wash affected skin with 5% solution of sodium bicarbonate ($NaHCO_2$). Activated charcoal is of no value. Do not give bicarbonate to neutralize the material.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Nitric acid is a powerful oxidizing agent that can react with combustible materials to cause fires. Sodium metal (not present in this mixture is a severe fire hazard; dust/air mixtures may ignite or explode. Sodium nitrate is a negligible fire hazard when exposed to heat or flame. No data are available for the mixture, and its behavior may differ from that of the individual components.

Extinguishing Media: Use extinguishing media appropriate to the surrounding fire: water spray, dry chemical, carbon dioxide, or foam. Use a water spray to dilute nitric acid and to absorb liberated oxides of nitrogen. (These guidelines apply to the mixture; when the components are considered separately, different precautions may apply.)

Fire Fighting: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Flash Point (°C): N/A

Autoignition (°C): N/A

Lower Explosive Limit (LEL): N/A

Upper Explosive Limit (UEL): N/A

Flammability Class (OSHA): N/A

Products of Combustion: Thermal decomposition of this material may produce nitrogen oxides, sodium oxides, and other products.

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Notify safety personnel of spills. Surfaces contaminated with this material should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

Disposal: Refer to Section 13, Disposal Considerations.

7. HANDLING AND STORAGE

Storage: Store unopened containers of this material in a dry place with acid-resistant flooring at room temperature. Protect from physical damage, water, humidity, heat, direct sunlight, and incompatible materials.

Safe Handling Precautions: Wear gloves and chemical safety goggles (Section 8). Engineering controls should maintain airborne concentrations below TLV (Section 8).

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Nitric Acid:

ACGIH TLV-TWA: 2 ppm or 5 mg/m^3
OSHA TLV-TWA: 2 ppm or 5 mg/m^3
UK WEL: 5.2 mg/m^3

Sodium Nitrate

OSHA TLV-TWA: None established. Total nuisance dust, 15 mg/m^3; respirable dust, 5 mg/m^3
ACGIH TLV-TWA: None established. Total nuisance dust, 10 mg/m^3; respirable dust, 3 mg/m^3
UK WEL: None established. Total inhalable dust, 10 mg/m^3; respirable dust, 4 mg/m^3

Sodium

OSHA TLV-TWA: None established. Total nuisance dust, 15 mg/m^3; respirable dust, 5 mg/m^3
ACGIH TLV-TWA: None established. Total nuisance dust, 10 mg/m^3; respirable dust, 3 mg/m^3
UK WEL: None established. Total inhalable dust, 10 mg/m^3; respirable dust, 4 mg/m^3

Ventilation: Use local or general exhaust to keep employee exposures below limits. Local exhaust ventilation is preferred because it can control contaminant emissions at the source, preventing dispersion into the general work area. Refer to the ACGIH document *Industrial Ventilation, a Manual of Recommended Practices*.

Respirator: If necessary, refer to the NIOSH document *Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84* for selection and use of respirators certified by NIOSH.

Eye Protection: Use chemical safety goggles where dusting or splashing of solutions may occur. See OSHA standard (29 CFR 1910.133) or European Standard EN166. The employer should provide an emergency eye wash fountain and safety shower in the immediate work area.

Personal Protection: Wear appropriate gloves and protective clothing to prevent contact with skin.

9. PHYSICAL AND CHEMICAL PROPERTIES

Nitric Acid	**Sodium Nitrate**	**Sodium**
Appearance and Odor: Colorless to slightly yellow liquid, darkens to brown upon aging and exposure to light; irritating, pungent odor.	**Appearance and Odor:** Colorless to white deliquescent crystal or powder; no odor	**Appearance and Odor:** Gray solid, no odor
Relative Molecular Weight: 63.02	**Relative Molecular Weight:** 84.99	**Relative Molecular Weight:** 22.99
Molecular Formula: HNO_3	**Molecular Formula:** $NaNO_3$	**Molecular Formula:** Na
Density (g/cm^3): 1.05 (10 %)	**Density (g/cm^3):** 2.26	**Density (g/cm^3):** 0.97
Solvent Solubility: Decomposes in alcohol	**Solvent Solubility:** Soluble in alcohol, methanol, ammonia	**Solvent Solubility:** Decomposes in alcohol; insoluble in benzene, naphtha, kerosene, ether
Water Solubility: Soluble	**Water Solubility:** Soluble	**Water Solubility:** Reacts violently with water
Boiling Point (ºC): 86 (187 °F)	**Boiling Point (ºC):** 380 (716 ºF), decomposes	**Boiling Point (ºC):** 883 (1621 ºF)
Vapor Density (Air=1): 2.17	**Vapor Density (Air=1):** N/A	**Vapor Density (Air=1):** N/A
pH: 1.0 (0.1 M solution)	**pH:** N/A	**pH:** N/A

NOTE: The physical and chemical data provided are for the pure components. Physical and chemical data for this solution do not exist. The actual behavior of the solution may differ from the individual components.

10. STABILITY AND REACTIVITY

Stability: __X__ Stable _____Unstable

Stable at normal temperatures and pressure.

Conditions to Avoid: Contact with incompatible materials.

Incompatible Materials:

Nitric Acid: Incompatible with numerous materials including organic materials, plastics, rubber, chlorine, and metal ferrocyanide.

Sodium Nitrate: Incompatible with combustible materials, metals, metal salts, metal oxides, cyanides, reducing agents, and acids.

Sodium: Incompatible with acids, combustible materials, oxidizing materials, metals, metal salts, bases, metal oxides, halogens, reducing agents, halocarbons, peroxides, and metal carbides. Sodium solid (not present in this SRM) may explode when exposed to moisture or mixed with halide compounds. Other sodium mixtures may explode when subjected to mechanical impact or heat.

Fire/Explosion Information: See Section 5.

Hazardous Decomposition: Thermal decomposition of this material may produce nitrogen oxides, sodium oxides, and other products.

Hazardous Polymerization: ____ Will Occur __X__ Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: __X__ Inhalation __X__ Skin __X__ Ingestion

Nitric Acid:

Human, oral, LD_{Lo}: 430 mg/kg
Rat, oral, LD_{50}: > 90 mg/kg
Rat, inhalation, LC_{50} (4 hrs): 130 mg/m^3

Sodium Nitrate:

Woman, oral, TD_{Lo} 14 mg/kg
Child, oral, LD_{Lo} 22.5 mg/kg
Rat, oral, LD_{50}: 1267 mg/kg

Sodium:

Rat, intraperitoneal, LD_{50} 4 g/kg

Target Organ(s): Skin, eyes, respiratory tract, GI tract, central nervous system, blood, or other target organs.

Mutagen/Teratogen: Nitric acid has caused birth defects in animals under experimental conditions, and has also been investigated as a possible mutagen. Mutagenicity testing of sodium nitrate has yielded equivocal results.

Health Effects: See Section 3.

12. ECOLOGICAL INFORMATION

Nitric Acid, Ecotoxicity Data:

Green shore crab (*Carcinus maenas*), LC_{50} (48 hrs): 180,000 µg/L
Starfish (*Asterias rubens*), LC_{50} (48 hrs): 100,000 to 330,000 µg/L
Hooknose (*Agonus cataphractus*), LC_{50} (48 hrs): 100,000 to 330,000 µg/L
Cockle (*Cerastoderma edule*), LC_{50} (48 hrs): 330,000 to 1,000,000 µg/L

Sodium Nitrate:

Pacific chorus frog (*Pseudacris regilla*), LC_{50} (10 days): 266,200 µg/L

Planehead filefish (*Monacanthus hispidus*), LC_{50} (96 hrs): 573,000 µg/L

Sodium:

Ayu (fish, *Plecoglossus altivelis*), NR-LETH (96 hrs): 500,000 µg/L

Water flea (*Daphnia magna*), EC_{50} (21 days): 1,020,000 µg/L

Environmental Summary: This mixture may be slightly toxic to aquatic life. Do not release to the environment.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: One or more components of this mixture are a RCRA hazardous waste. Dispose of container and unused contents in accordance with federal, state, and local requirements for acid waste, which vary according to location.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Nitric Acid Solution, Hazard Class 8, UN2031, Packing Group II

15. REGULATORY INFORMATION

U.S. REGULATIONS

CERCLA Sections 102a/103 (40 CFR 302.4):

Nitric Acid: RQ = 1000 lbs.
Sodium Nitrate: Not regulated
Sodium: RQ = 10 lbs.

SARA Title III Section 302: Nitric acid is regulated

SARA Title III Section 304: Nitric acid is regulated

SARA Title III Section 313: Nitric acid and sodium nitrate (N511, Nitrate Compounds) are regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE:	Yes
CHRONIC:	No
FIRE:	Yes
REACTIVE:	Yes
SUDDEN RELEASE:	No

STATE REGULATIONS

California Proposition 65: No components are regulated.

CANADIAN REGULATIONS

WHMIS Classification:

Nitric Acid: C (oxidizing material), D1A (very toxic material), E (corrosive material)
Sodium Nitrate: C (oxidizing material)
Sodium: B4 (flammable solid)

WHMIS Ingredient Disclosure List:

Nitric Acid 1%
Sodium Nitrate 1%

CEPA Domestic Substances List (DSL): All three components are regulated.

EUROPEAN REGULATIONS

EU/EC Classification:

Nitric Acid: O (Oxidizer), C (Corrosive)
Sodium Nitrate: O (Oxidizer); not classified in Annex I of Directive 67/548/EEC; not on a priority list.
Sodium: F (Flammable), C (Corrosive)

Risk Phrases (mixture):

R23 (toxic by inhalation)
R25 (toxic if swallowed)
R34 (causes burns)
R36/37/38 (irritating to eyes, respiratory system and skin)

Safety Phrases (mixture):

S20/21 (when using, do not eat, drink or smoke)
S28 (wash after contact with skin)
S45 (in case of accident or illness, see doctor; show label)
S60 (dispose of this material and its container as hazardous waste)

NATIONAL INVENTORY STATUS

U.S. Inventory (TSCA): All components are listed.

TSCA 12(b), Export Notification: No components are listed.

16. OTHER INFORMATION

Sources:

IUCLID Chemical Data Sheet: Sodium Nitrate. 19 February 2000.

IUCLID Chemical Data Sheet: Sodium. 19 February 2000.

PAN Pesticides Database: Nitric Acid.

PAN Pesticides Database: Sodium and Sodium Nitrate.

U.S. National Institute for Occupational Safety and Health, *NIOSH Pocket Guide to Chemical Hazards*, September 2005 edition. DHHS (NIOSH) Publication No. 2005-151.